

Dynamic microsimulation: what is it (used for in Europe)?

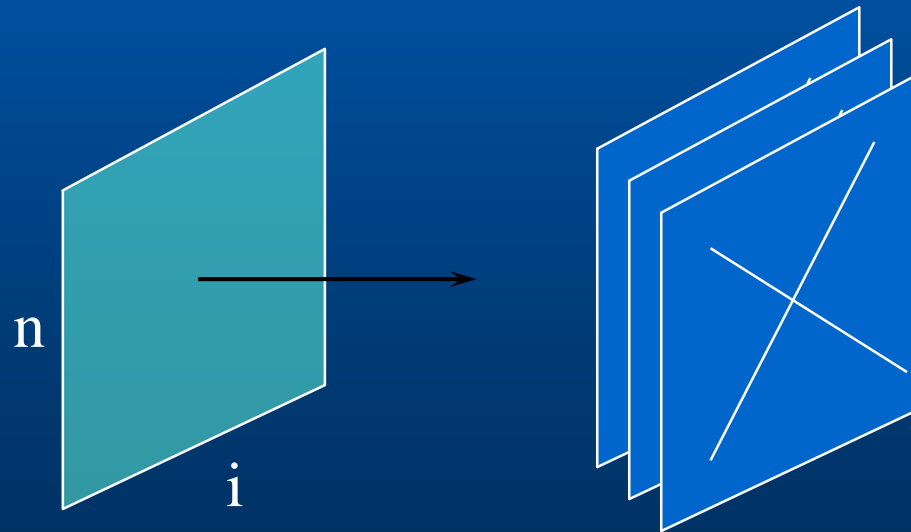
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January 20th, 2017, 2nd MEETING OF THE
WORKING GROUP ON AGEING ISSUES

What is microsimulation?

- Look beyond the averages
- Purpose: to impute missing (micro) data
 - Alternative realities at t
 - Prospective scenarios ($> t$)
- Based on actual or synthetic micro-datasets

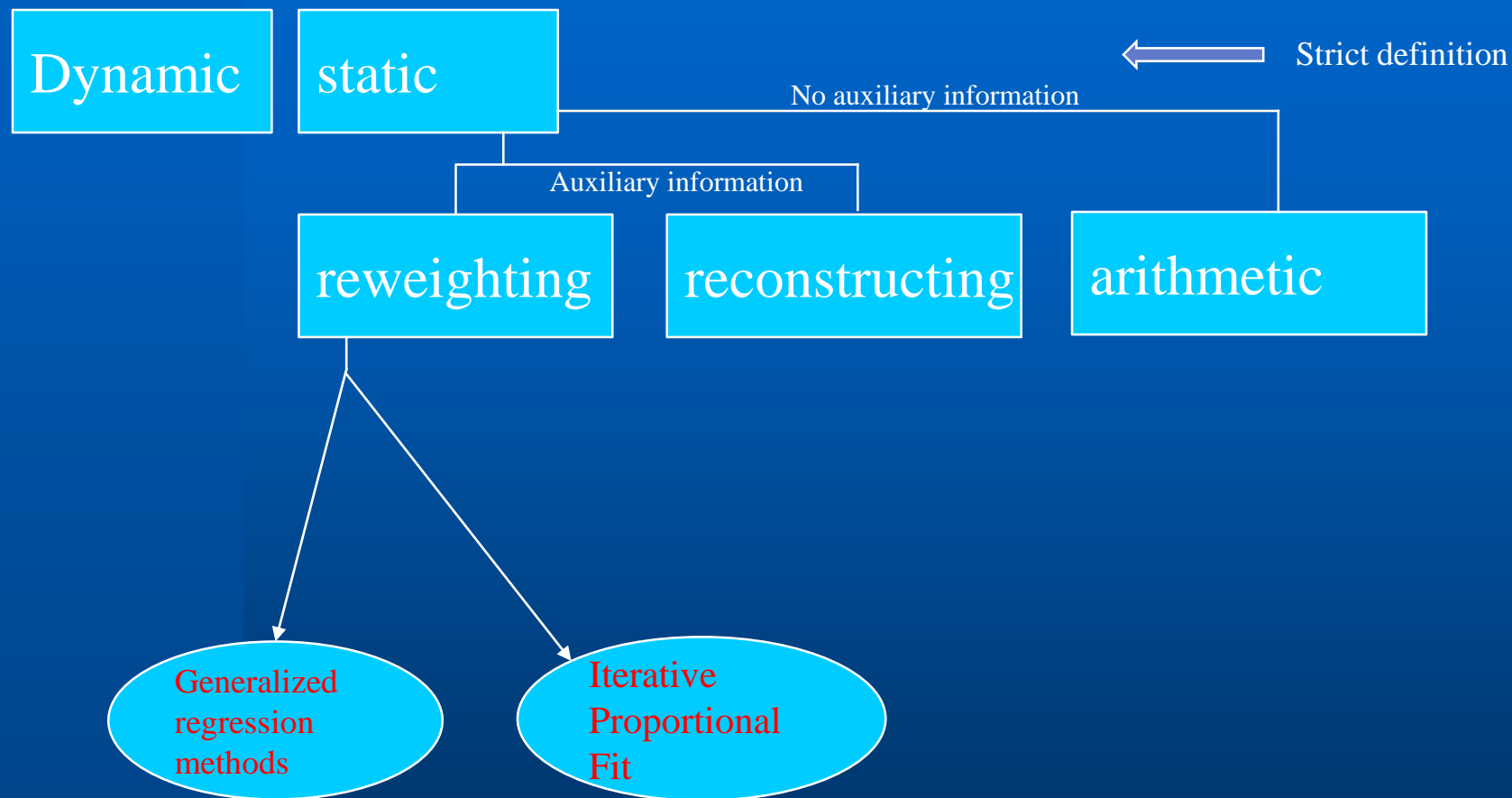


What is microsimulation? A classification

- What is a **dynamic** microsimulation model?
 - **Strict definition**: the characteristics of the micro-units change over time
 - **broader definition**: the model includes some notion of time
- As we will see in the classification of models, models with **static ageing** are considered “dynamic” only in the broader definition.
- In the literature, usually the strict definition is used. But for the users of the simulation results, the broader definition might sometimes be more relevant.



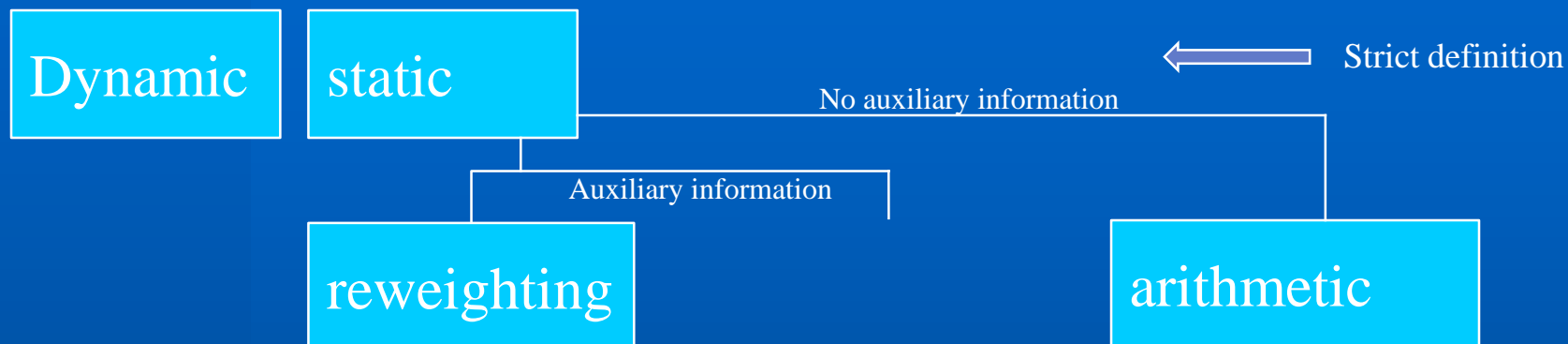
A classification of microsimulation models



However: if the auxiliary information is **prospective**, then a static model includes a notion of “time” and thus becomes dynamic in the loose definition.



Some models used in the EU member states



IER-model (Slovenia)

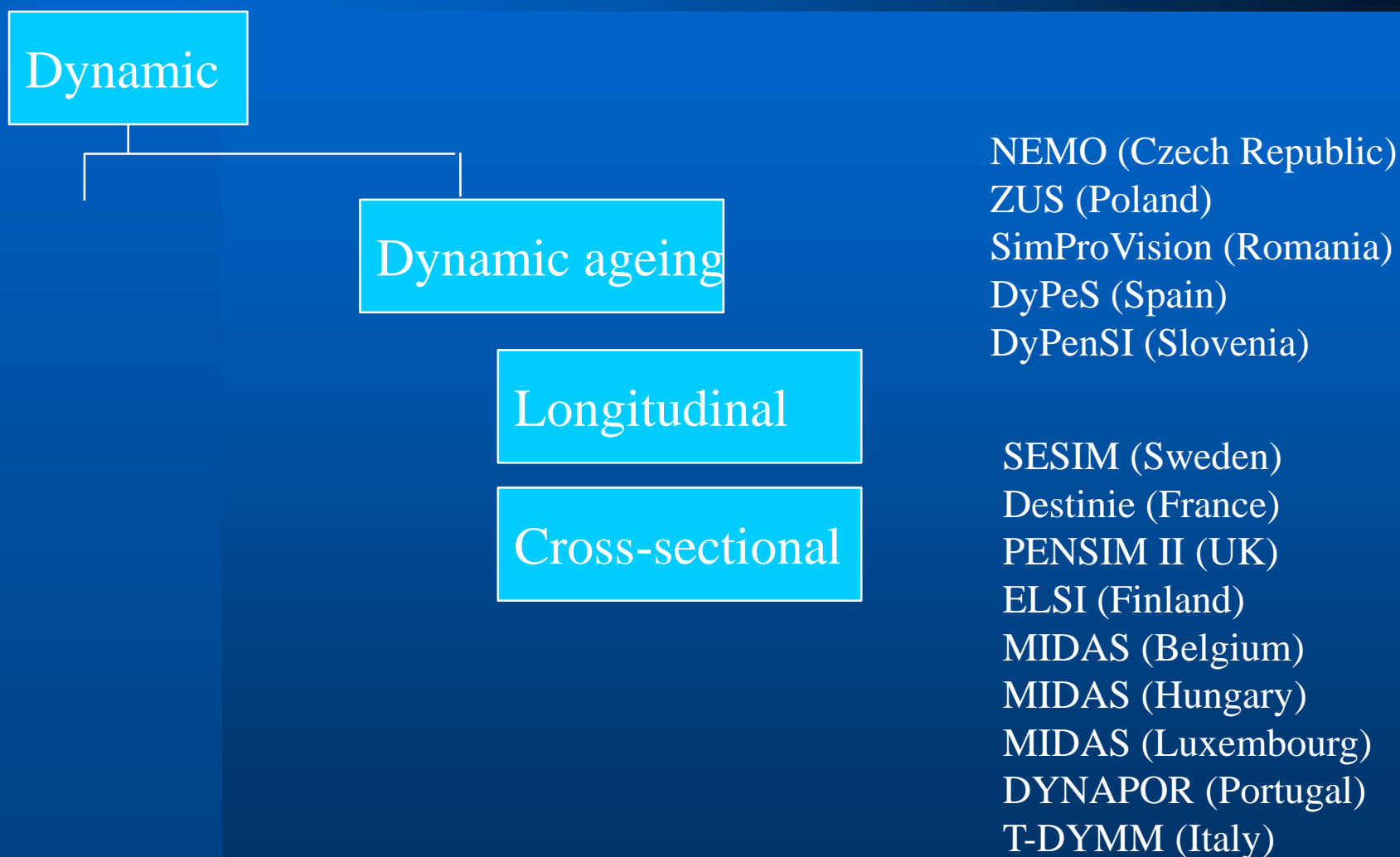
FaMiMod (Italy/Istat)

Euromod

These models are technically static, but dynamic in the loose definition. So some authors (e.g. Colombino, 2015; Dekkers, 2009) would classify them as dynamic.



A classification of microsimulation models



An application: what are the consequences of the AWG projections and hypotheses on pension adequacy

- Initiative within the SPC WG-AGE to use **dynamic microsimulation models** available in member states to simulate prospective developments in (pension) adequacy while taking into account the projections and hypotheses of the AWG.
- Reported in the 2015 PAR
- A collaboration between **Sweden** (Ministry of Finance), **Hungary** (Central Administration of National Pension Insurance; ONYF) and **Belgium** (Federal Planning Bureau)
- Demonstrate the potential contribution of dynamic microsimulation



Financial and social sustainability: two sides of the same coin

- SPC and AWG: a clear and recognized need for a joint assessment
 - AWG: prospective indicators of sustainability and the benefit ratio.
 - SPC: 'current' SILC-based indicators of adequacy (financial poverty risk) and forward-looking theoretical replacement ratios.
 - “Microsimulation techniques can also be used to draw a more fine-grained picture of the evolution in particular of old-age poverty in the future” (2015 PAR, v.I, 222)
 - Analysis designed to be complementary to TRR.



Dynamic microsimulation models

- Sweden - SESIM

- Ministry of Finance, the Economic Affairs Department
- Produces simulation results for the AWG
- Starting dataset is 300 K individuals in 1999
- Includes financial wealth, home ownership, private savings
- The oldest and most developed model of the three used in this project

- Belgium – MIDAS

- Federal Planning Bureau
- Starting dataset is 300K individuals in 2001, expanded to 2.2 K² individuals
- Alignment to reflect AWG projections

- Hungary – MIDAS_HU

- Central Administration of National Pension Insurance
- Developed on the basis of MIDAS Belgium
- Starting dataset is 2 K² individuals in 2012
- The most recent model of the three



Developments in BE, HU, and SE (AWG/msm)

Belgium ¹	2013	2020	2030	2040	2050	2060	Peak year
Population growth rate (in %)	0.7	0.9	0.8	0.7	0.5	0.4	2022
Old-age dependency ratio (65+ / 15-64)	27.1	29.7	34.7	37.2	37.9	39.9	2060
Labour force participation rate 55-64	44.0	54.0	55.8	56.8	56.3	56.0	2038
Employment rate 55-64	41.6	51.4	53.3	54.3	53.7	53.5	2038
Men: Duration of retirement/average working career	51.5	52.8	55.5	58.3	60.9	63.4	2060
Men: Percentage of adult life spent at retirement	31.1	31.9	33.1	34.2	35.1	36.1	2060
Women: Duration of retirement/average working career	58.9	63.7	66.3	68.9	71.5	73.9	2060
Women: Percentage of adult life spent at retirement	33.7	35.5	36.4	37.3	38.2	38.9	2060
Hungary	2013	2020	2030	2040	2050	2060	Peak year
Population growth rate (in %)	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	2020
Old-age dependency ratio (65+ / 15-64)	25.4	31.0	34.4	40.5	47.5	52.6	2060
Labour force participation rate 55-64	41.8	64.8	77.7	76.4	77.9	77.5	2048
Employment rate 55-64	38.6	60.9	73.5	72.5	73.9	73.6	2048
Men: Duration of retirement/average working career	38.5	37.2	39.7	43.0	46.1	49.2	2060
Men: Percentage of adult life spent at retirement	25.7	24.9	26.2	27.8	29.2	30.5	2060
Women: Duration of retirement/average working career	64.4	51.3	51.9	55.2	58.3	61.3	2013
Women: Percentage of adult life spent at retirement	34.7	30.0	30.3	31.6	32.8	34.0	2013
Sweden	2013	2020	2030	2040	2050	2060	Peak year
Population growth rate (in %)	0,9	0,9	0,7	0,6	0,5	0,4	2021
Old-age dependency ratio (65+ / 15-64)	30,2	33,1	35,7	37,4	37,6	41,5	2060
Labour force participation rate 55-64	77,7	77,1	77,3	78,7	79,2	78,9	2047
Employment rate 55-64	73,7	74,0	74,5	75,8	76,3	76,0	2047
Men: Duration of retirement/average working career	39,3	41,3	43,4	45,4	47,2	49,0	2060
Men: Percentage of adult life spent at retirement	27,1	27,9	28,8	29,8	30,6	31,4	2060
Women: Duration of retirement/average working career	48,6	53,4	55,8	58,1	60,3	62,4	2060
Women: Percentage of adult life spent at retirement	31,2	32,8	33,8	34,7	35,5	36,3	2060



Alignment to AWG projections and hypotheses

- SESIM

- Population (fertility, mortality, migration)
- Average unemployment and participation rates, to age groups
- Earnings per year increase with productivity and average hours worked
- All parameters follow AWG hypothesis

- MIDAS Belgium and MIDAS Hungary

- Population (fertility, mortality; *NO immigration or emigration*)
- All labour market states (working, public/private sector, civil servants) , to age groups and gender
- All non-working states (unemployment, disabled, pre-retirement), idem
- Other inactive/retirement as balance entries
- Earnings per hour increase with productivity (to gender)
- All parameters follow AWG hypothesis



AWG results

- Projected gross public pension spending by scheme (% of GDP)

	2013	2020	2030	2040	2050	2060
Sweden	9.3	8.6	8.2	7.8	7.5	7.8
Hungary	11.8	10.1	9.2	9.9	10.9	11.7
Belgium	12.2	13.2	15.3	15.8	15.5	15.7

Source: Country Fiche on Pensions Hungary, Sweden and Belgium; prepared for the AWG projections for age-related public expenditure 2015

- **Main drivers:**

- **Sweden:** decreasing benefit ratio and replacement ratio more than counter the increasing dependency ratio.
- **Hungary:** countering impacts of increasing dependency ratio and decreasing (early age) coverage ratio. Over the whole period, the replacement rate and benefit ratio continuously decrease.
- **Belgium:** increasing dependency ratio – the negative contributions of the coverage ratio and benefit ratio is limited.



The choice of indicators

Holzmann and Hinz (2005)

- At-risk-of-poverty-rate
- Gini
- S80/S20
- For the total population, and various subgroups
 - Pensioners: those receiving a pension benefit
 - Elderly (65+)
 - Working population

Old-age poverty

Smooth lifetime
consumption



Results for Hungary

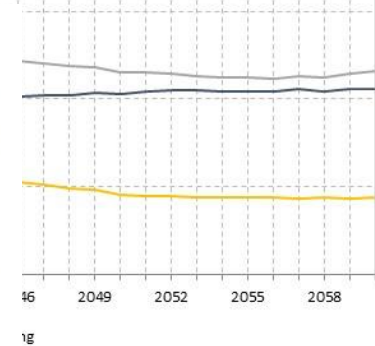
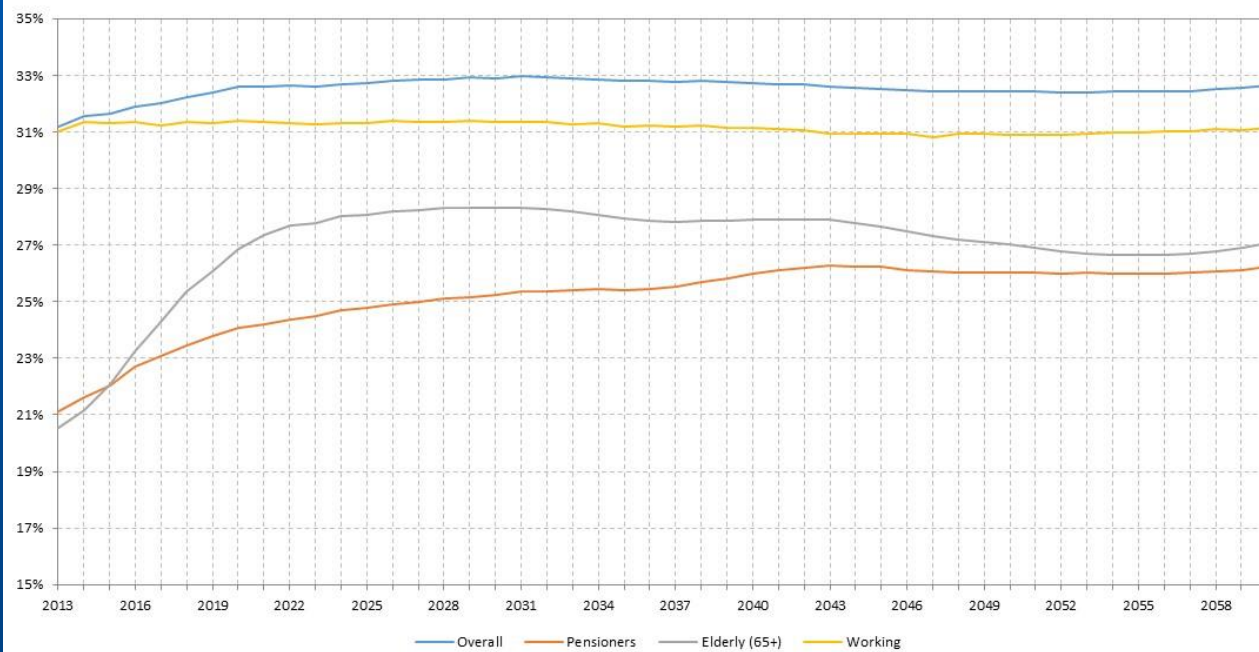
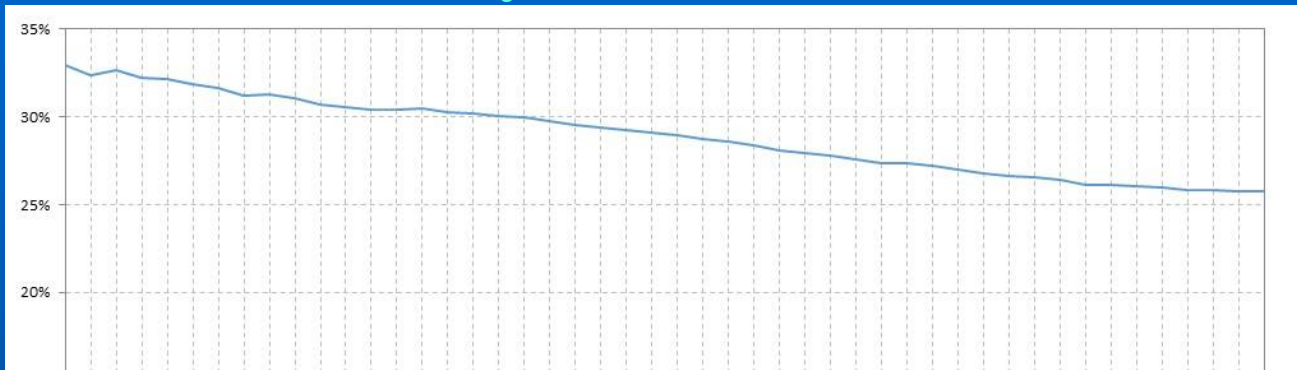
- One-pillar, PAYG, DB pension system
- Benefit a function of contribution years, and average net income after 1987
- Indexed to forecasted inflation
- AROP



Results for Hungary

At Risk of Poverty Rate

Gini



Results for Sweden

- Swedish pension system

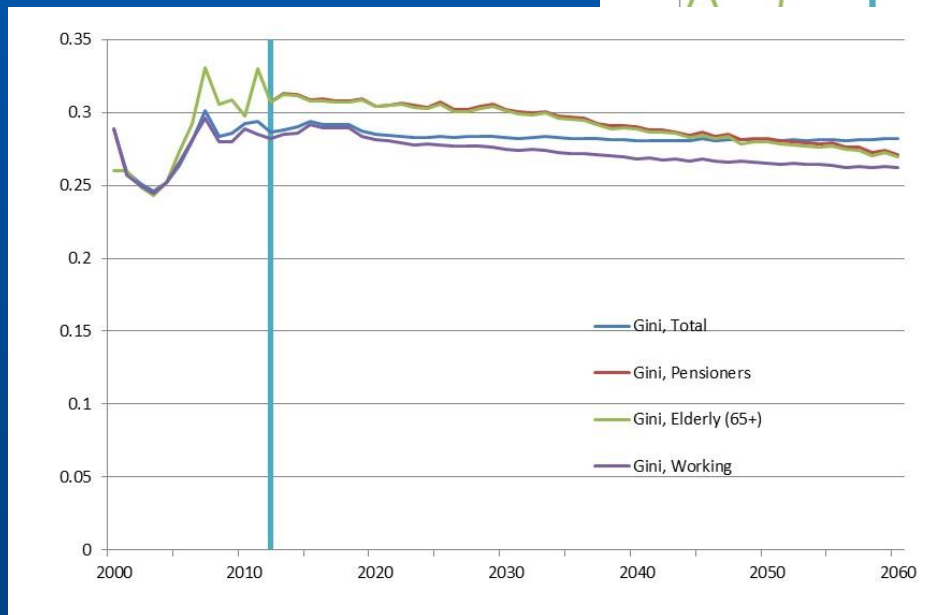
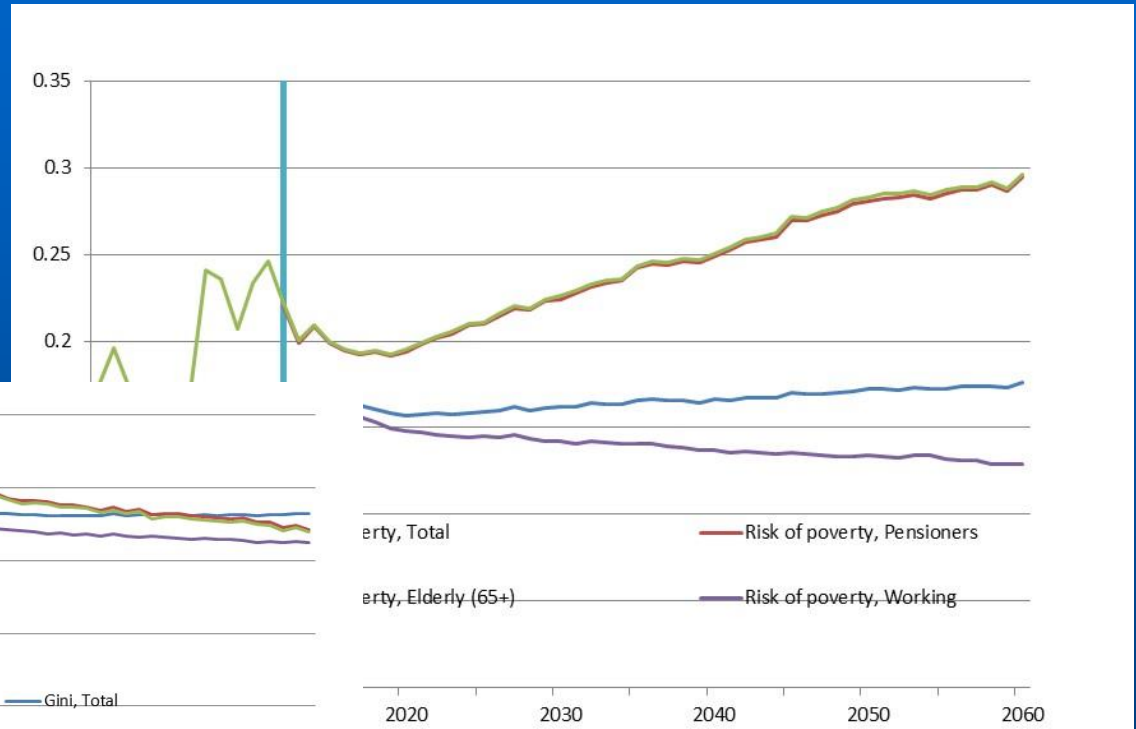
- Reformed system implemented in 2003
- Notionally Defined Contribution (PAYG/NDC) with a Defined Contribution system
- Pension-income-tested minimum benefit
- Applies to all those born 1938 or later
- Previous system: flat-rate pension, together with an earnings-related PAYG component
- The last cohorts with pension rights in the old system will retire around 2020



Results for Sweden

At Risk of Poverty Rate

Gini



Results for Belgium

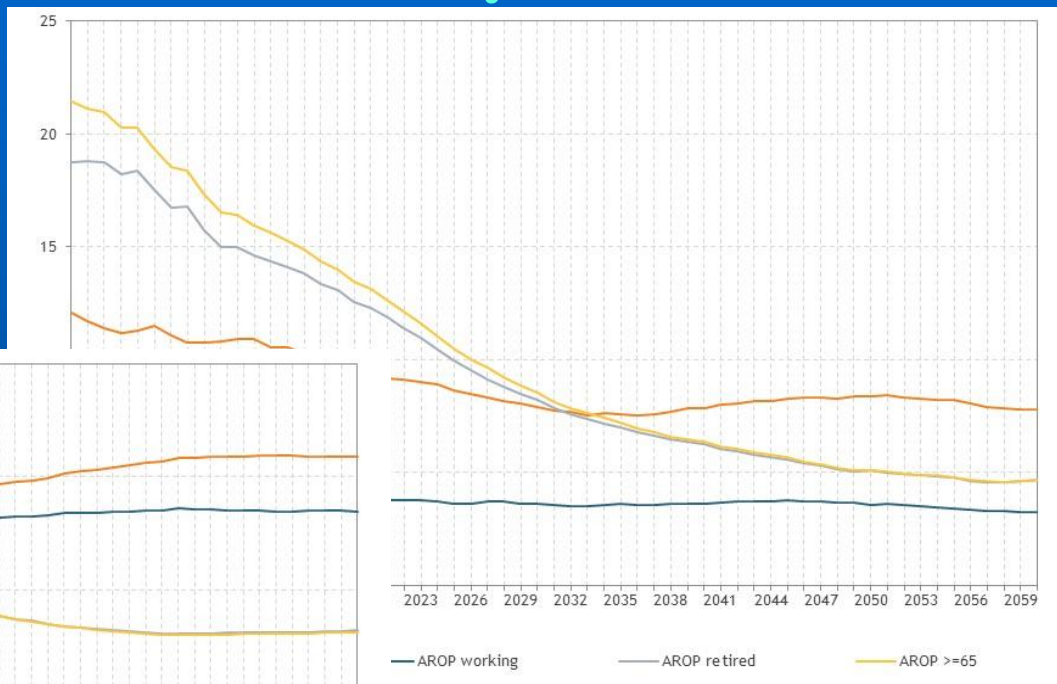
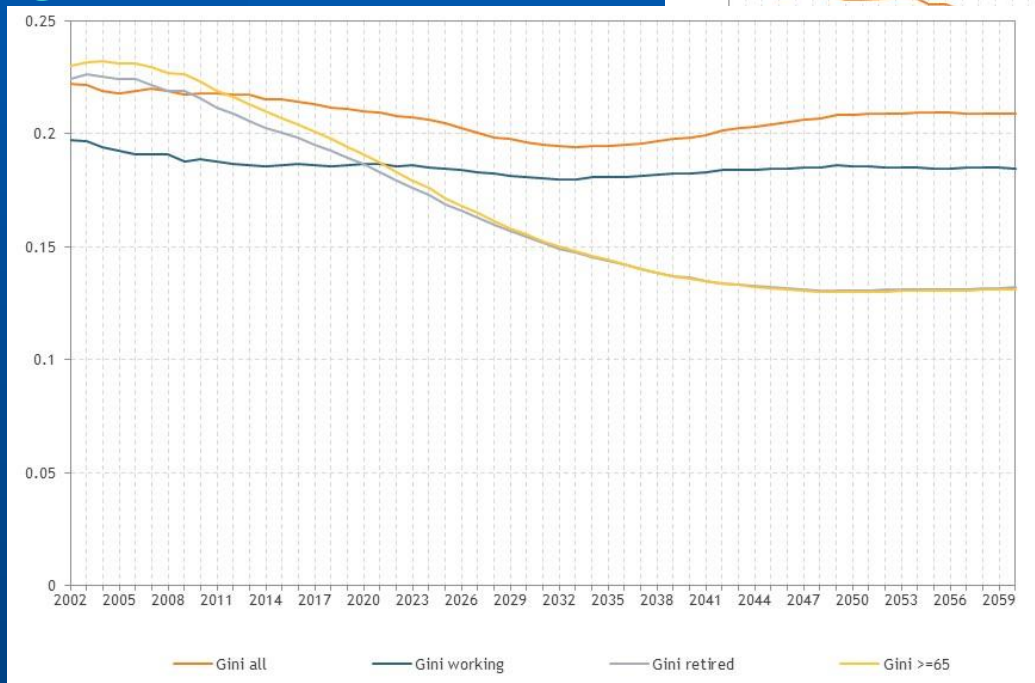
- Three pillars:
 - Mandatory Statutory pension system, DB/PAYG + means-tested 'Guaranteed Income for Elderly Persons
 - Wage earners
 - Civil servants
 - Self-employed
- Retirement age 65, but retirement possible from 62 on, given minimum career length
- Equivalent periods
- Private occupational pension schemes
- Private individual savings and pension schemes
- Indexation regime



Results for Belgium

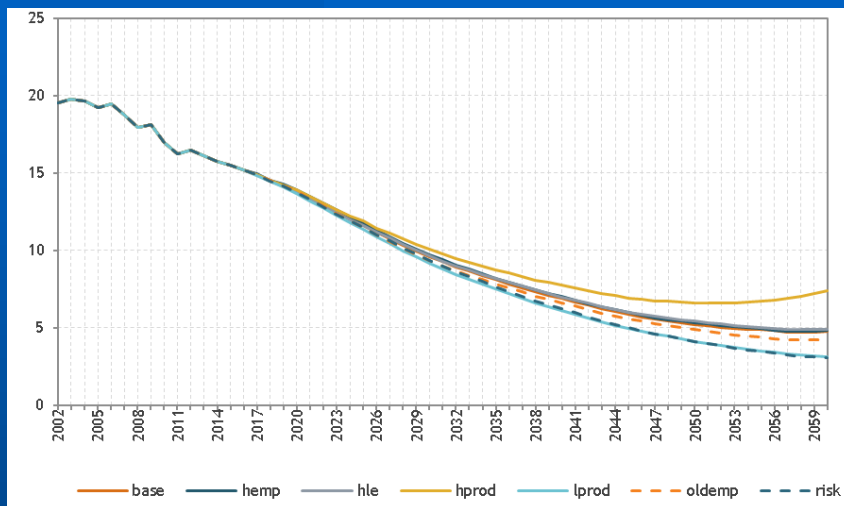
At Risk of Poverty Rate

Gini

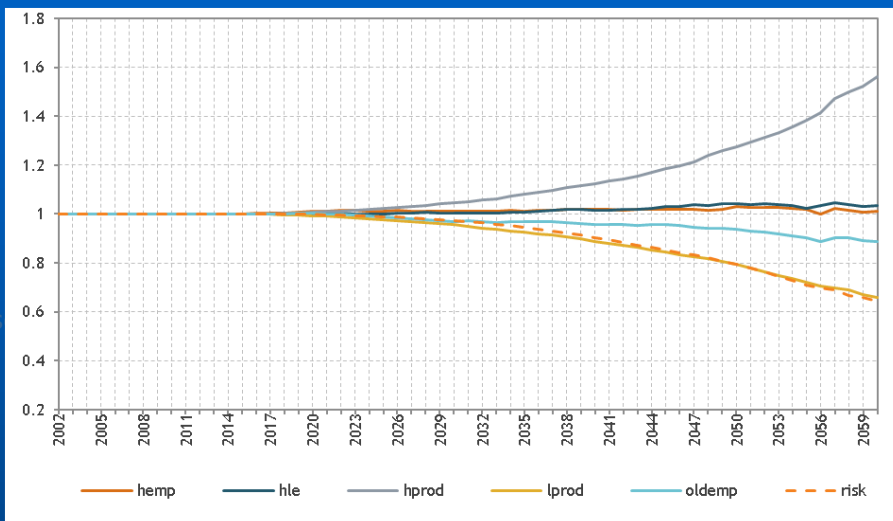



A quick word on the sensitivity scenarios...

At Risk of Poverty Rate



Difference with reference scenario



Scenario	Public pension 2013-2016 (%-point difference from base scenario)	AROP	
Higher life expectancy (HLE)	0.7	+, ±	
High productivity (HPROD)	-0.9	++	tradeoff
Low productivity (LPROD)	1.0	--	tradeoff
Higher employment (HEMP)	-0.4		
Higher employment older workers (OLDEMP)	-1.1	--	
Lower TFP rate (RISK)	1.0	--	



An application: what are the consequences of the AWG projections and hypotheses on pension adequacy

- Some conclusions
 - Financial and social sustainability: two sides of a coin
 - This project shows the use of microsimulation in the joint assessment of adequacy and sustainability of pensions.
 - It is remarkable that the results on adequacy complement the results on financial sustainability
- In Sweden, pension expenditures as a percentage of GDP decline; AROP increases.
- In Belgium, pension expenditures to GDP increase, while AROP decreases.
- Increasing the employment of older workers results a reduction of the budgetary costs of ageing, while reducing the poverty risk among the elderly.



A brief look to the future

- The output of this project was reported in the 2015 PAR
- Reactions were quite positive
- DG EMPL and the president of the SPC WG-AGE have explicitly stated in their ambitions for the 2018 PAR
 - “...it would be important to try to extend the group of countries volunteering to develop projections with the help of micro-simulation methodologies” (Synopsis of the 2018 PAR, §4.1.1., page 6)



A brief look to the future

- Belgium has again offered to take the lead in this exercise for the 2018 PAR
 - Hungary has formally agreed to participate
 - Informal and exploratory contacts have been established with modeling teams in countries with comparable models.
- The members of the SPC WG-AGE have received a invitation via CIRCA.
- Please contact me should your country be interested in participating





**Thank You
For Listening**

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**Any
Questions?**

